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Wehrenberg

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(54) **ACCELERATION-BASED THEFT DETECTION SYSTEM FOR PORTABLE ELECTRONIC DEVICES**

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(51) **Int. Cl.**
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(52) **U.S. Cl.** **340/571**; 340/539.1; 340/539.11; 340/541; 340/586.1; 340/686.1; 340/669

(58) **Field of Classification Search** 340/568.1, 340/539.1, 539.11, 541, 571, 669, 686.1, 340/425.5
See application file for complete search history.

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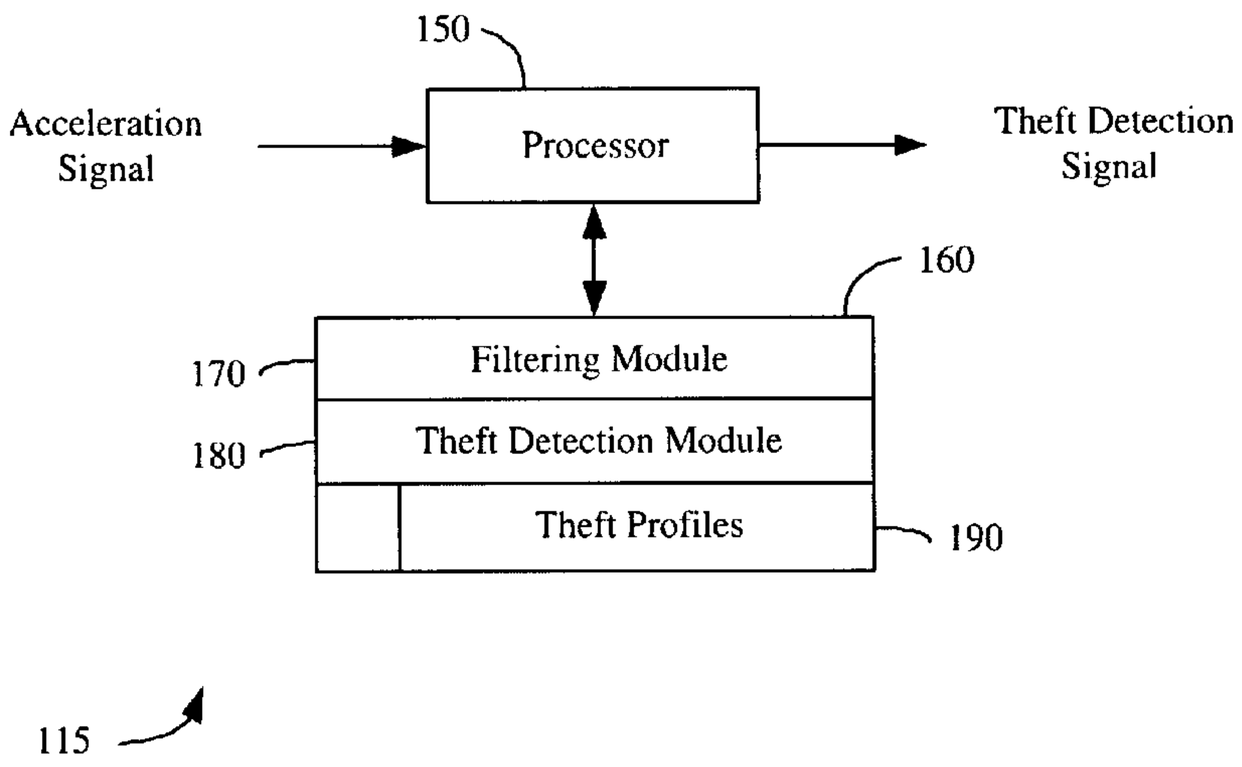
(57) **ABSTRACT**

A theft prevention system for protecting portable electronic devices is disclosed. An acceleration sensor detects the acceleration of a portable electronic device, and a controller analyzes this acceleration to determine whether a theft condition is present. If so, an alarm can be initiated. The theft prevention system can include a filter for attenuating irrelevant acceleration frequencies and isolating those representative of theft, and comparison hardware/software for determining whether the detected acceleration matches a known acceleration profile characteristic of theft. Various parameters of the theft prevention system can also be set by a user through mechanisms such as a graphical user interface.

15 Claims, 5 Drawing Sheets



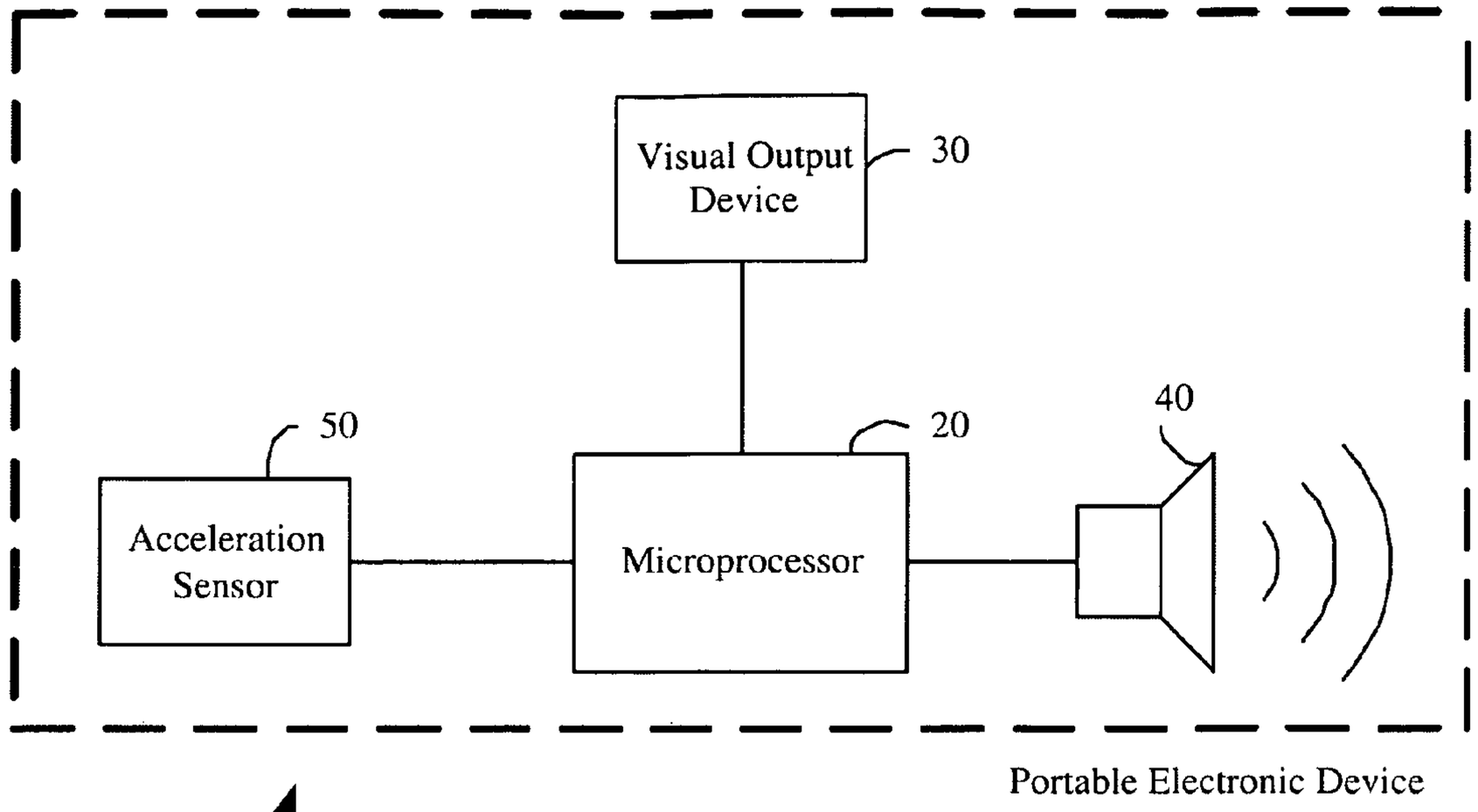

Visual Output Device
30
50
Acceleration Sensor
20
Microprocessor
40
Portable Electronic Device
10

FIG. 1

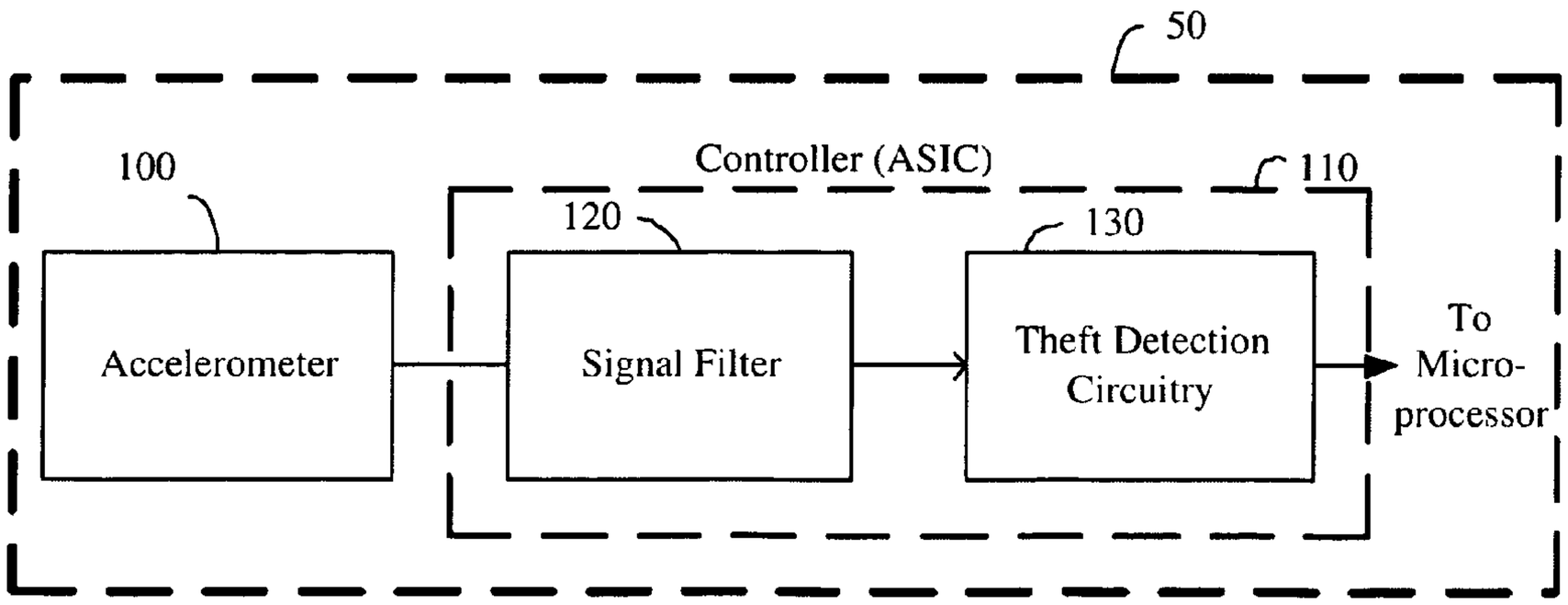

50
100
Accelerometer
Controller (ASIC)
110
120
Signal Filter
130
Theft Detection Circuitry
To Micro-processor

FIG. 2

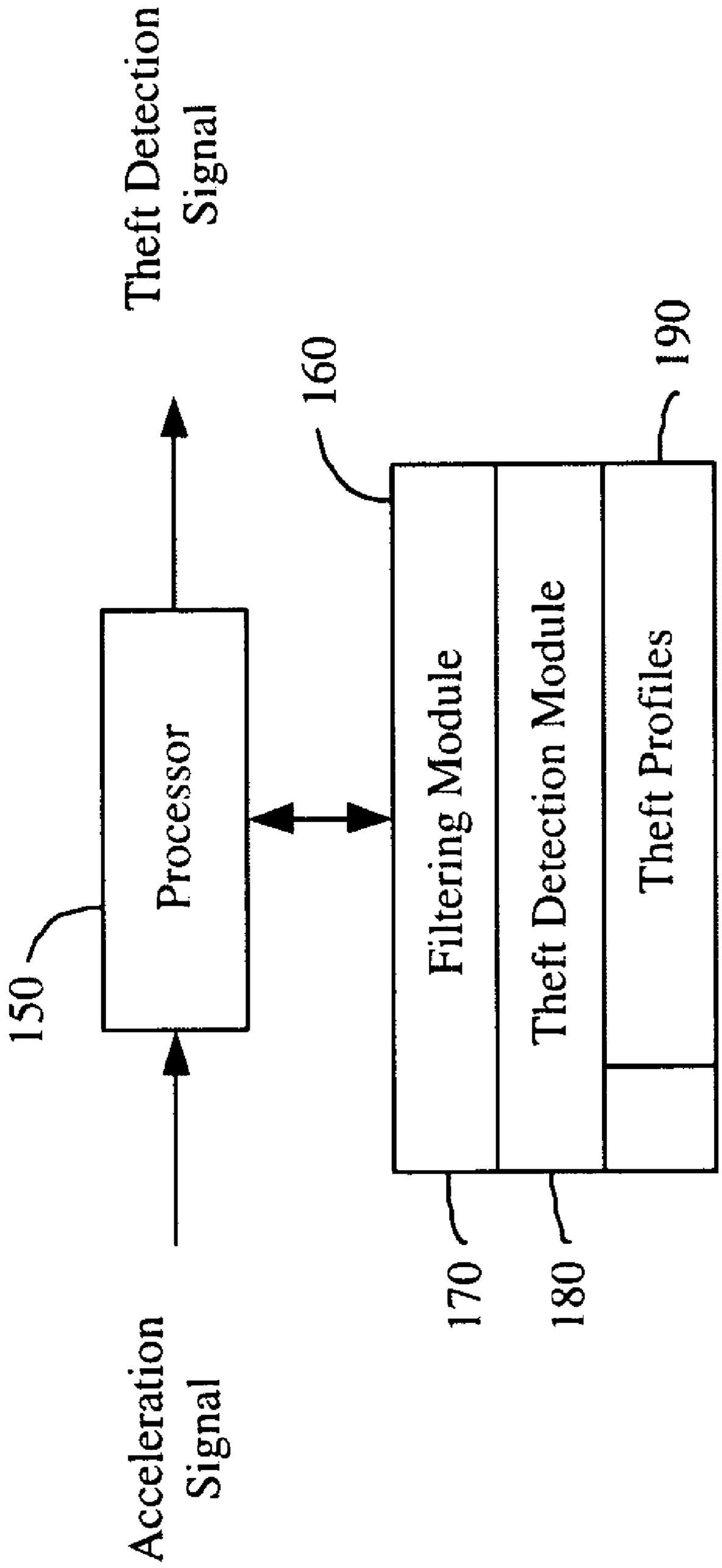

Theft Detection Signal
160
190
Processor
150
Filtering Module
Theft Detection Module
Theft Profiles
170
180
Acceleration Signal
115

FIG. 3

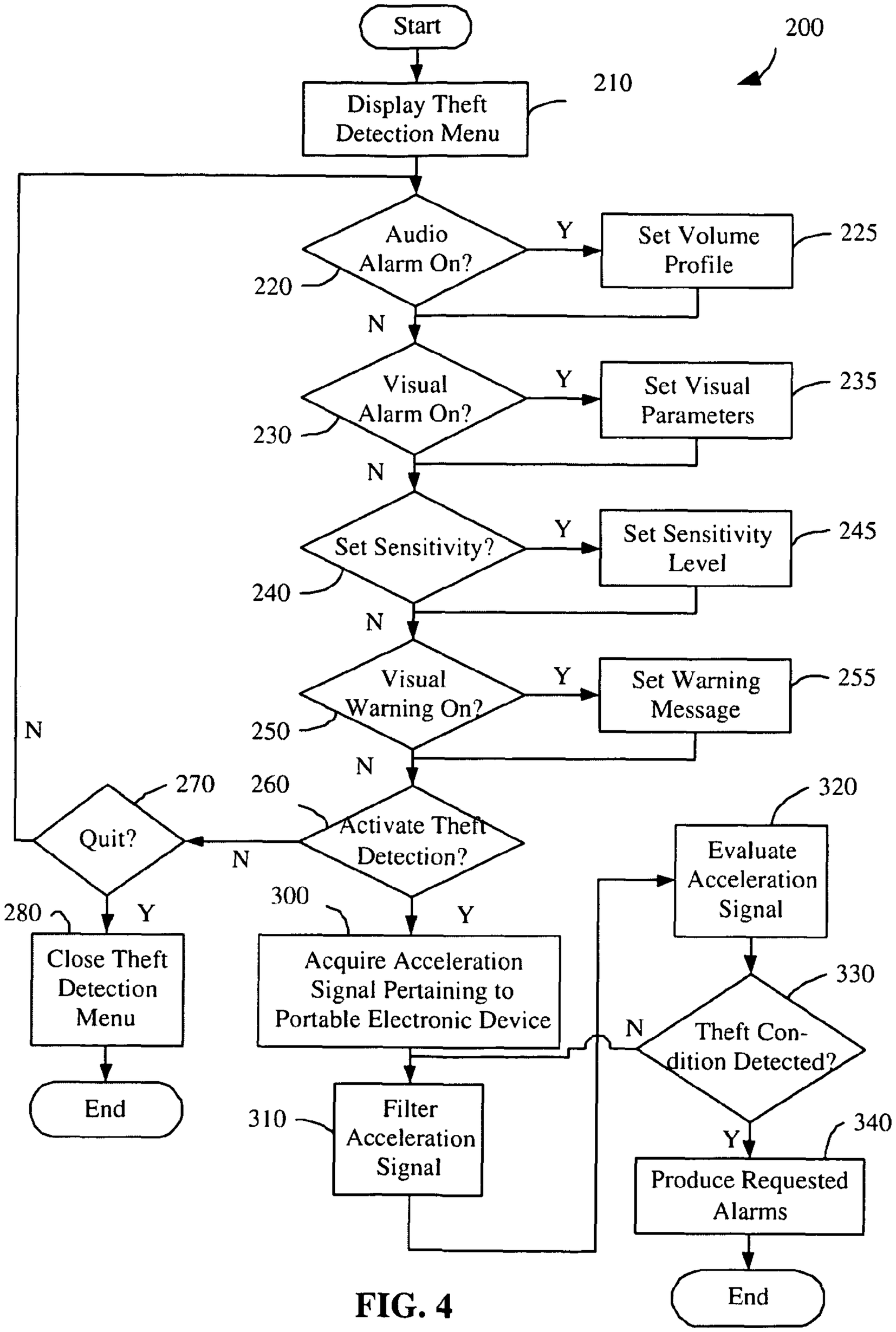

Start
200
Display Theft Detection Menu
210
Audio Alarm On?
220
Y
Set Volume Profile
225
N
Visual Alarm On?
230
Y
Set Visual Parameters
235
N
Set Sensitivity?
240
Y
Set Sensitivity Level
245
N
Visual Warning On?
250
Y
Set Warning Message
255
N
Activate Theft Detection?
260
N
Quit?
270
Y
Close Theft Detection Menu
End
280
Y
Acquire Acceleration Signal Pertaining to Portable Electronic Device
300
Filter Acceleration Signal
310
Evaluate Acceleration Signal
320
Theft Condition Detected?
330
N
Y
Produce Requested Alarms
340
End

FIG. 4

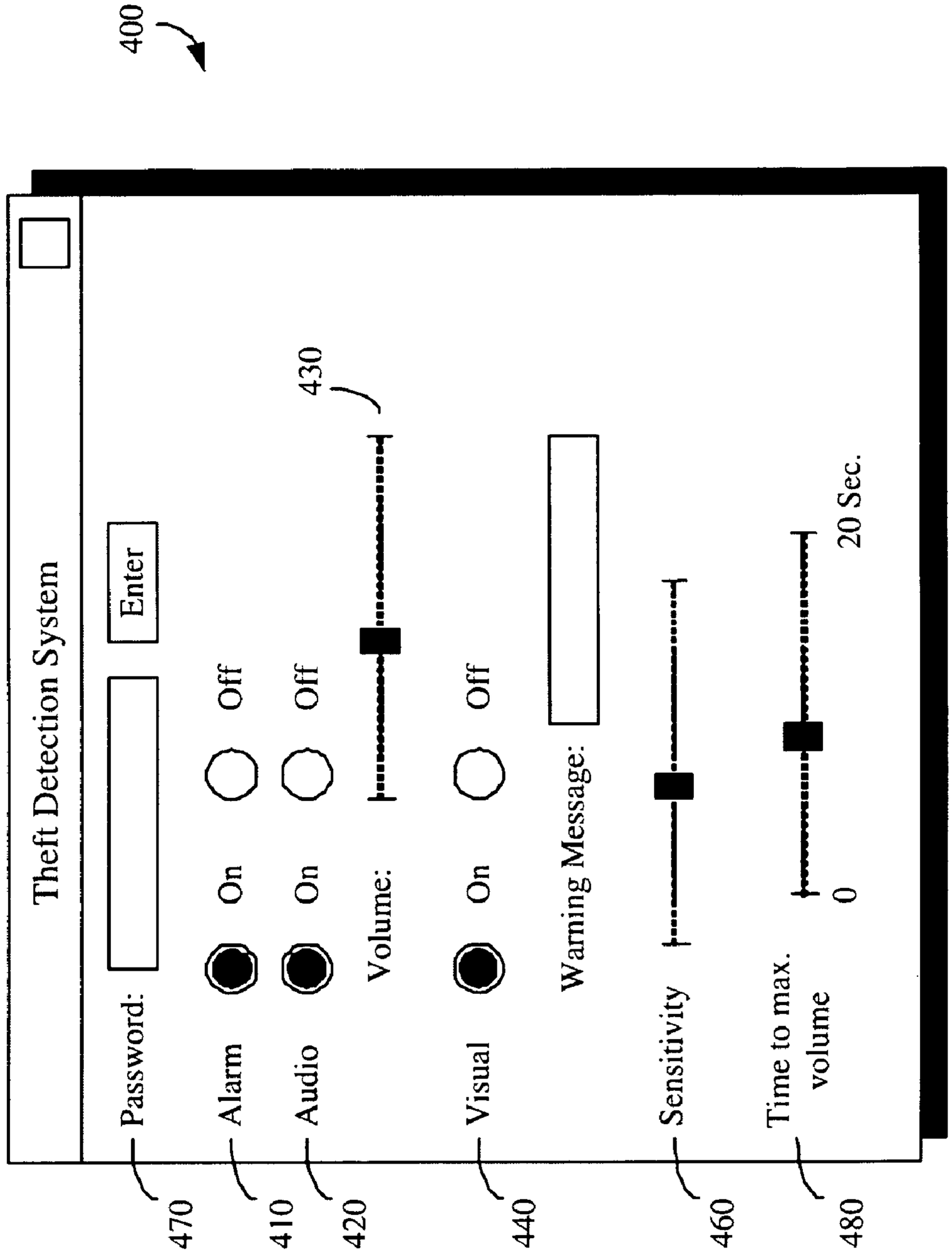

400
Theft Detection System
Password:
Enter
Alarm
On
Off
Audio
On
Off
Volume:
430
Visual
On
Off
Warning Message:
Sensitivity
Time to max. volume
0
20 Sec.
470
410
420
440
460
480

FIG. 5

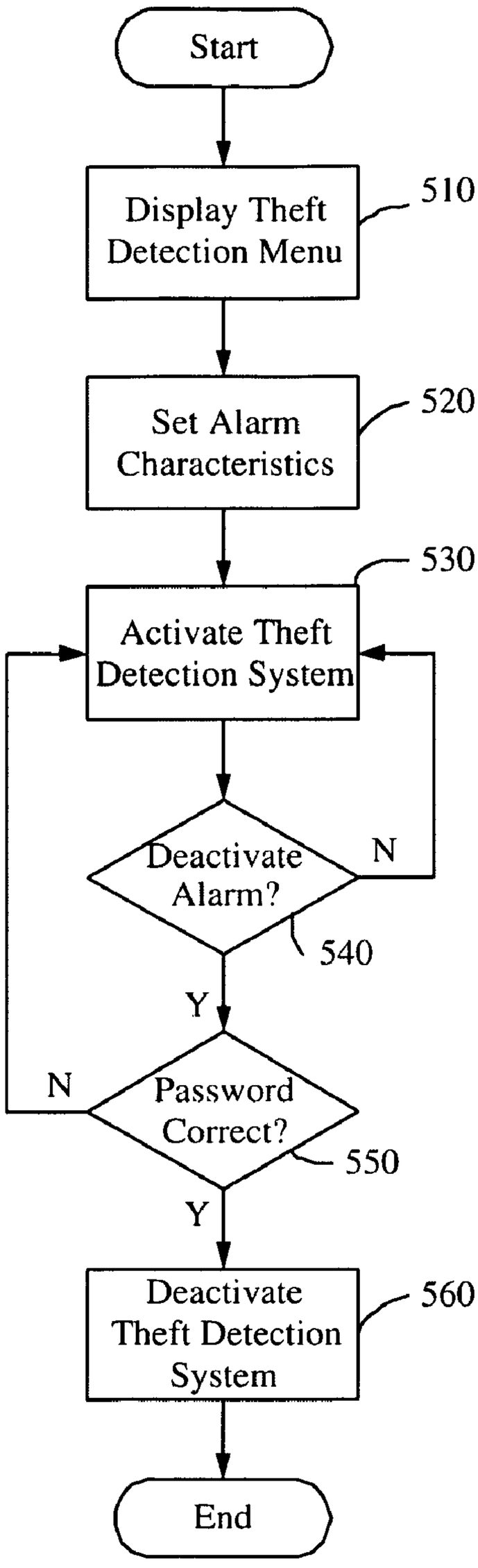

Start
Display Theft Detection Menu
510
500
Set Alarm Characteristics
520
Activate Theft Detection System
530
Deactivate Alarm?
N
540
Y
Password Correct?
N
550
Y
Deactivate Theft Detection System
560
End

FIG. 6

ACCELERATION-BASED THEFT DETECTION SYSTEM FOR PORTABLE ELECTRONIC DEVICES

CROSS REFERENCE TO RELATED APPLICATIONS

This application is a Continuation application of U.S. patent application Ser. No. 11/681,664 filed Mar. 2, 2007 U.S. Pat. No. 7,548,161, which is a Divisional application of U.S. patent application Ser. No. 10/791,495 entitled "ACCELERATION-BASED THEFT DETECTION SYSTEM FOR PORTABLE ELECTRONIC DEVICES" filed Mar. 1, 2004, now U.S. Pat. No. 7,218,226 issued May 15, 2007, both of which are incorporated herein by reference in their entirety for all purposes.

BRIEF DESCRIPTION OF THE INVENTION

This invention relates generally to portable electronic devices. More specifically, this invention relates to theft detection systems for portable electronic devices.

BACKGROUND OF THE INVENTION

The drive toward miniaturization of electronics has resulted in computer-based systems that are becoming much more portable. Current portable electronic devices such as laptop computers, hand-held devices such as cellular telephones and personal media devices, such as the iPod™ from Apple Computer, Inc., and even devices such as compact disc players, are sufficiently compact and lightweight as to make them easily movable. Unfortunately, such ease of transport also implies ease of theft. While the rightful owner of a portable electronic device may conveniently transport it almost anywhere, so can a thief.

One current anti-theft system is a simple mechanical lock that attaches to the housing of a device, with a cable that wraps around other objects so as to affix the portable device to these objects. In this manner, portable electronic devices can be effectively tethered to nearby fixtures, making theft difficult. However, such systems suffer from drawbacks. For instance, users are forced to carry around a bulky cable and lock, thus somewhat defeating the purpose of portable electronic devices. Also, users may sometimes wish to leave their devices in areas where there is no convenient fixture to tether to.

It is therefore desirable to develop a theft detection system for portable electronic devices. It is further desirable to develop a theft detection system that does not require the use of additional bulky physical mechanisms, and which is capable of functioning in many different locations.

SUMMARY OF THE INVENTION

Broadly speaking, the invention pertains to detecting theft of portable electronic devices. The acceleration of a device is monitored and processed to determine whether a likely theft condition exists. If so, the various embodiments of the invention then seek to prevent theft by initiating an alarm.

The invention can be implemented in numerous ways, including as a method, system, device, apparatus, or computer readable medium. Several embodiments of the invention are discussed below.

As a computer readable memory including at least computer instructions for directing an electronic system to provide theft protection, one embodiment of the invention comprises at least: a first set of computer instructions to acquire an acceleration signal corresponding to an acceleration of the electronic system, the acceleration signal having frequencies characteristic of movement of the device; a second set of computer instructions to process the acceleration signal so as to isolate the frequencies characteristic of movement of the device; a third set of computer instructions to compare the acceleration signal to a frequency profile so as to determine a metric measuring a correspondence between the frequency profile and the frequencies characteristic of movement of the device; and a fourth set of computer instructions to initiate the production of an alarm based upon the metric.

As a method of protecting a portable electronic device against theft, one embodiment of the invention comprises at least the acts of: acquiring an acceleration signal corresponding to an acceleration of the electronic system, the acceleration signal having frequencies characteristic of movement of the device, processing the acceleration signal so as to isolate the frequencies characteristic of movement of the device, comparing the acceleration signal to a frequency profile so as to determine a metric measuring a correspondence between the frequency profile and the frequencies characteristic of movement of the device, and initiating the production of an alarm based upon the metric.

As a portable electronic device having a system for protecting against theft, one embodiment of the invention comprises a microprocessor for processing executable computer instructions, and an acceleration sensor for detecting an acceleration undergone by the portable consumer electronic product in communication with the microprocessor, wherein the acceleration sensor examines characteristics of the detected acceleration to determine if a theft condition is present, the acceleration sensor transmits a theft detection signal to the microprocessor that responds to the theft detection signal by broadcasting an alarm.

Other aspects and advantages of the invention will become apparent from the following detailed description taken in conjunction with the accompanying drawings which illustrate, by way of example, the principles of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding of the invention, reference should be made to the following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. **1** illustrates a block diagram of a portable electronic device constructed in accordance with an embodiment of the invention.

FIG. **2** illustrates a block diagram of a an acceleration sensor constructed in accordance with an embodiment of the invention.

FIG. **3** illustrates an exemplary controller for detecting theft in accordance with an embodiment of the invention.

FIG. **4** illustrates a flow diagram of a theft detection process according to an embodiment of the invention.

FIG. **5** illustrates a graphical user interface for configuring of a theft detection system in accordance with an embodiment of the invention.

FIG. **6** illustrates a flow diagram of a process according to an embodiment of the invention.

Like reference numerals refer to corresponding parts throughout the drawings.

DETAILED DESCRIPTION OF THE INVENTION

In one embodiment of the invention, one or more accelerometers are placed within a portable electronic device to

detect acceleration. Any acceleration detected could indicate unauthorized movement of the device, i.e., potential theft. Typically, theft or other large-scale movement of the device results in an acceleration signal having characteristics different from other events such as shock, impact, nearby machinery, etc. The detected acceleration as a function of time is thus analyzed to determine whether it corresponds to such large-scale movement of the device, rather than an innocuous event such as the impact of a book dropped nearby. If so, an alarm is produced in order to alert others to the theft. Further embodiments of the invention include the ability to tune various parameters to the user's liking through a graphical user interface (GUI), and the ability to disable theft detection.

In such a manner, theft detection is accomplished via relatively small and lightweight accelerometers that can be incorporated into the portable electronic device itself, without the need for additional locks and/or cables. Also, as such a system can be contained within the device, it can provide theft protection even in areas where the device cannot be tethered or attached to anything.

FIG. **1** illustrates a block diagram of a portable electronic device having a theft detection system constructed in accordance with an embodiment of the invention. A portable electronic device **10** is controlled by a microprocessor **20**, which processes instructions and sends information to a visual output device **30**, such as a monitor or other mechanism for displaying visual information to a user, and an audio output device **40**, such as a speaker. The portable electronic device **10** also includes an acceleration sensor **50** for detecting accelerations undergone by the device **10**. The acceleration sensor **50** includes any mechanism for detecting acceleration, such as one or more accelerometers, as well as necessary hardware/software for controlling the accelerometers. The one or more accelerometers can be configured along a different axis.

In operation, the acceleration sensor **50** detects acceleration undergone by the portable electronic device **10**, such as when the portable electronic device **10** is picked up by a thief. Upon examining the characteristics of the acceleration and determining that a theft condition is present, the acceleration sensor **50** transmits a theft detection signal to the microprocessor **20**, which broadcasts an alarm through the audio output device **40** and/or displays a message across the visual output device **30**. In this manner, nearby persons are alerted to the attempted theft and/or the thief is deterred from completing the theft.

In order to more accurately detect theft and to avoid "false alarms" such as the triggering of an alarm when no theft is actually occurring, the invention can include signal conditioning hardware and/or software for filtering out those acceleration signals that do not represent a theft condition. For example, the signal conditioning hardware and/or software should filter out those acceleration signals corresponding to shock or impact.

FIG. **2** illustrates a block diagram of the acceleration sensor **50** constructed in accordance with an embodiment of the invention. The acceleration sensor **50** includes accelerometers **100** for detecting acceleration, and a controller **110**, which can be an application-specific integrated circuit (ASIC). In this embodiment, the controller **110** includes a signal filter **120** and theft detection circuitry **130**. The signal filter **120** is a frequency filter designed to attenuate certain acceleration frequencies and pass others. The theft detection circuitry **130** analyzes the passed frequencies to determine whether a theft condition is present. The acceleration sensor **50** is typically built on a single circuit board, with the accelerometers **100** mounted on the board and electronically connected to an controller **110**. The invention includes alternative embodiments, however. For instance, the accelerometers **100** can be mounted on or in the housing of the portable electronic device **10** and remote from an ASIC controller **110**. It is also possible for the signal filter **120** and/or the theft detection circuitry **130** to be integrated into or performed by the microprocessor **20**, in which case the controller **110** can be considered one module of the microprocessor **20**.

The accelerometers **100** are (directly or indirectly) coupled to the housing of the portable electronic portable electronic device **10**, where they detect acceleration undergone by the portable electronic device **10**. The accelerometers **100** convert this acceleration to an electronic acceleration signal and supply this signal to the controller **110**. It is common for the accelerometers **100** to pick up acceleration frequencies characteristic of both theft and other innocuous events. Examples of innocuous events include: the vibration of a car passing by, or someone dropping an object on a table upon which the portable electronic device **10** is placed. As a result, the invention includes systems and methods for filtering out and isolating certain frequencies that tend to be characteristic of theft, i.e. identifying one or more theft conditions, and signaling an alarm accordingly. In this manner, many false alarms are avoided.

It is known that large-scale movements commonly generate lower frequency acceleration signals. For instance, the carrying of a laptop may result in that laptop experiencing accelerations in the range of one to hundreds of Hz. However, events not including transport of the device, such as shock or impact, generate higher frequency signals, typically in the kHz range and above. Thus, the signal filter **120** can implement a low pass filter designed to attenuate such higher shock/impact frequencies, and to pass lower frequencies associated with movements like theft. In this manner, the signal filter **120** would act to isolate lower frequencies for easier detection. The theft detection circuitry **130** can then detect the presence of such lower frequencies and send a theft detection signal to the microprocessor **20** when appropriate.

To further reduce the risk of false alarms, the signal filter **120** and theft detection circuitry **130** can be configured not just as a simple threshold system that signals an alarm based on the detection of frequencies below a certain frequency, but also as a system programmed to detect certain acceleration frequency spectra characteristic of theft. Thus, empirical or theoretical data can be used to determine frequency profiles common to many theft situations, and the controller **110** can be programmed to scan for those particular profiles. For instance, if it is determined that the manual transport of a particular portable electronic device **10** often results in the portable electronic device **10** undergoing accelerations in the range of 1-25 Hz (say, due to the rhythmic movement caused by a thief's walking or running), along with accelerations in the range of 100-200 Hz (perhaps due to quicker changes in direction, jumping, etc.), the signal filter **120** can be designed to pass frequencies only in those ranges. The theft detection circuitry **130** can then send a theft detection signal to the microprocessor **20** only upon detecting frequencies in both ranges.

From the above, it should be clear to those skilled in the art that the theft detection circuitry **130** can be designed to look for any such profile of acceleration frequencies. In this manner, the invention includes the detection of theft through comparing the actual acceleration of a portable electronic device to any predetermined acceleration frequency spectrum, and signaling an alarm accordingly.

It should also be apparent to those skilled in the art that the theft detection processes of the controller **110** can be carried out in hardware and/or software configurations. More specifi-

cally, the filtering and detection processes can be carried out by either hardware (such as the application-specific circuitry outlined in FIG. **2**) or software instructions. While hardware for carrying out the above operations offers many advantages in terms of processing speed and the like, a software configuration can offer added functionality and flexibility. FIG. **3** illustrates an exemplary controller **115** for detecting theft using a software configuration in accordance with an embodiment of the invention. Here, the controller **115** includes a processor **150** in electronic communication with a memory **160** that stores modules containing instructions for carrying out various processes. In this embodiment, the modules include a filtering module **170** containing instructions for filtering acceleration signals, and a theft detection module **180** containing instructions for evaluating the filtered acceleration signal and indicating a theft condition. The theft detection module **180** can include or make use of a set of theft profiles **190** for comparison to the acceleration signal. Such a configuration allows the processor **150** to monitor and receive an acceleration signal from the accelerometers **100**, filter the signal, and analyze the filtered signal, such as by comparing it to one or more of the theft profiles **190**, to determine whether theft is occurring. As discussed below, a comparison metric can be calculated, either explicitly or implicitly, to determine the degree to which a detected acceleration matches a theft profile. If such comparison indicates theft, the processor **150** then sends out a theft detection signal to the microprocessor **20**.

The memory **160** can be a read-only memory, or it can be a re-writable memory. The latter configuration offers advantages in terms of flexibility. For instance, a re-writable memory **160** allows the various modules to be updated periodically, so that advances in filtering techniques or additional theft profiles can be added later. This allows the controller **110** to be upgraded over time, so as to provide better theft protection.

Attention now turns to a more detailed explanation of the operations taken in detecting theft and signaling an alarm. Accordingly, FIG. **4** illustrates a flow diagram of a theft detection process **200** according to an embodiment of the invention. The Theft detection process **200** is performed by a portable electronic device, such as the portable electronic device **10** illustrated in FIG. **1**.

Once it is desired to start the theft detection (process **200**), the portable electronic device **10** displays a theft detection menu on the visual output device **30** (block **210**). The theft detection menu can be a Graphical User Interface (GUI) that allows users of the portable electronic device **10** to initiate theft detection on demand. The GUI can also include a number of different options allowing a user to configure their desired theft detection in a number of ways. In this embodiment, the GUI allows users to select whether an audio alarm should sound upon detection of theft (block **220**). If the user so decides to utilize the audio alarm, the GUI allows them to set the level of its volume, as well as the ramp-up time, described below (block **225**). The GUI next allows users to specify whether they desire a visual alarm message (block **230**). If so, visual parameters such as the text or font size of the alarm message to be displayed can be set (block **235**).

Next, the sensitivity of the alarm can be set (blocks **240**, **245**). Such a sensitivity setting can take on a number of forms, all within the scope of the invention. For instance, the sensitivity can set a minimum duration during which an acceleration profile matching that of a theft is detected, with higher sensitivities implying a shorter duration before which an alarm is signaled. Alternatively, the sensitivity setting can set a minimum number of discrete frequency values that are detected and that must match a given frequency profile before a theft is indicated. In this manner, sensitivity implies how well a detected acceleration frequency profile matches a known theft acceleration frequency profile. It should be recognized that the invention encompasses these and other definitions of sensitivity.

Next, the GUI can request users to specify whether they desire a visual warning to be displayed on the visual output device **30** (block **250**). This visual warning is typically a warning prominently displayed on a monitor or other easily-seen device, which warns potential thieves of the fact that the device **10** currently has an active theft detection system protecting it. As an added measure, the GUI can also allow users to specify their warning message (block **255**). Hence, the user can set a custom warning message or select from predetermined warning messages.

After any or all of the above parameters have been set (or even if the user does not set any, instead relying on a set of default parameters), the GUI allows the user to activate the theft detection system (block **260**). If it is not desired to activate the system, users are given the option to quit (exit) (block **270**), which closes the GUI and ends the program (block **280**). Alternatively, if theft detection is activated, the specified warning message (if any) is displayed on the visual output **30** to warn potential thieves, and the acceleration detection and analysis process described above is initiated. Namely, the acceleration of the portable electronic device **10** is monitored to acquire an acceleration signal pertaining to the portable electronic device **10** (block **300**). As above, this acceleration signal can pertain a frequency spectrum reflecting the range of frequencies the portable electronic device **10** is subjected to at any given time. The acceleration signal is then filtered to attenuate irrelevant frequencies and isolate those that are more indicative of theft (block **310**). This filtered signal, reflecting those frequencies that can indicate theft, is then evaluated to determine the degree to which a theft condition is present (block **320**).

In many instances, such evaluation commonly includes the analysis of a metric that indicates the degree to which the acceleration signal matches a known theft condition. Such a metric can be any known measure of correlating two different quantities. For example, the metric can be a simple count of how many detected frequencies match those of a known theft condition, or it can be a complex spectrum analysis reflecting the degree to which the detected spectrum matches a known spectrum of a theft condition. As above, such the metric can be simply a determination of whether certain frequencies are present, or how long they are present. However, it can also be a comparison of the detected acceleration spectrum (or the spectrum as modified by the signal filter **120**) to an acceleration spectrum known to be representative of theft. Those of skill will realize that the invention includes the evaluation of any one or more metrics, whether explicitly calculated or implied in a comparison of frequencies, to reliably detect theft conditions from a sensed acceleration.

If a theft condition is detected (block **330**), such as when the metric exceeds a certain predetermined value, a theft detection signal is output to the microprocessor **20** indicating a theft is occurring. Upon receipt of a theft detection signal, the microprocessor **20** triggers the audio output device **40** to sound an audible alarm, and/or the visual output device **30** to flash a visual alarm message (block **340**). As above, various parameters of the audio and visual alarms can be specified beforehand via the GUI. Once a theft is detected and an alarm is sounded, the theft detection process **200** ends.

Many portable electronic devices **10** are capable of entering a sleep mode during periods of inactivity. Such a sleep

mode commonly involves halting or reducing the operations of the microprocessor **20** in order to conserve electrical power. However, for optimal protection of the device **10**, theft detection should continue even during sleep mode. The acceleration sensor **50** is thus configured to operate independent of the microprocessor **20**. If a theft condition is detected while the microprocessor **20** is in sleep mode, the theft detection circuitry **130** transmits a theft detection signal as in step **330**, preceded by a signal designed to wake the microprocessor **20** from sleep mode (alternatively, the microprocessor **20** can be programmed to wake from sleep mode upon receipt of the theft detection signal itself). In this manner, the invention ensures that the device **10** can conserve power while still maintaining protection against theft.

FIG. **5** illustrates a graphical user interface (GUI) **400** for configuring a theft detection system in accordance with an embodiment of the invention. The GUI **400** provides a convenient and user-friendly mechanism for specifying various theft detection parameters. In this example, the GUI **400** offers users the option of initiating theft detection **410** and, when theft detection is desired, whether an audible alarm **420** and/or a visual alarm **440** are to be utilized. If such alarms are desired, the user can also specify the maximum alarm volume **430** and/or warning message **450** desired. As discussed above, sensitivity **460** of the alarm can also be specified. For example, the audio volume **430** and the sensitivity **460** can be controlled by slider bars such as shown in FIG. **5**. Also capable of being specified is the time to maximum volume **480**, which sets a time period in which the alarm volume ramps up from a lower volume to the specified maximum volume **430**. This ramp-up time allows users who accidentally set off the alarm to disable it before it becomes annoying to those nearby. Finally, if it is desired to halt theft detection, such as when the rightful owner returns to his or her device **10** and wishes to carry it somewhere without an alarm going off, the GUI **400** provides a password box **470** for the user to turn off theft detection.

FIG. **6** illustrates a flow diagram of a deactivation process **600** according to an embodiment of the invention. The deactivation process **600** disables the theft detection. As above, once the GUI **400** is displayed (block **510**) and the user sets the appropriate alarm characteristics (block **520**), theft detection is initiated (block **530**). For instance, a user of a laptop computer may desire to leave the computer for a period of time. In such case, the user pulls up the GUI **400**, sets the alarm characteristics as desired, and initiates theft detection. When the user later returns to the computer, the user can deactivate the alarm (block **540**) by entering the correct password. For example, the user can enter a password into the password box **470**. If the password is correct (block **550**), the deactivation process **400** halts theft detection (step **560**), allowing users to resume normal operation of the portable electronic device **10**.

The foregoing description, for purposes of explanation, used specific nomenclature to provide a thorough understanding of the invention. However, it will be apparent to one skilled in the art that the specific details are not required in order to practice the invention. In other instances, well-known circuits and devices are shown in block diagram form in order to avoid unnecessary distraction from the underlying invention. Thus, the foregoing descriptions of specific embodiments of the present invention are presented for purposes of illustration and description. They are not intended to be exhaustive or to limit the invention to the precise forms disclosed, obviously many modifications and variations are possible in view of the above teachings. For example, the controller **110**, **115** or the microprocessor **20** can be configured to filter or modify acceleration signals, and evaluate or compare them to any profile, as appropriate in order to reliably detect theft conditions. The embodiments were chosen and described in order to best explain the principles of the invention and its practical applications, to thereby enable others skilled in the art to best utilize the invention and various embodiments with various modifications as are suited to the particular use contemplated. It is intended that the scope of the invention be defined by the following claims and their equivalents.

What is claimed is:

1. A theft detection system, comprising:

a graphical user interface configured to display a theft detection system menu and arranged to provide assistance to a user, wherein the assistance includes initiating the theft detection system and configuring the theft detection system to initiate an output of an alarm using an output device when a theft condition is present wherein when the theft detection system is not active, the graphical user interface receives a user input event at the theft detection system menu for activating the theft detection system, otherwise, the graphical user interface receives a user input event at the theft detection menu for configuring the theft detection system;

a memory device;

an accelerometer arranged to generate an acceleration signal in accordance with an acceleration of the device, wherein the acceleration signal includes frequencies characteristic of movement of the device; and

a processor arranged to determine if the theft condition is present, wherein the processor determines if the theft condition is present by processing the acceleration signal by isolating the frequencies characteristic of movement of the device detecting acceleration signal frequencies below a threshold frequency indicative of the theft condition, detecting acceleration frequency spectra of the detected acceleration signal frequencies that are characteristic of the theft condition, scanning for at least one frequency profile consistent with at least one theft condition, comparing the detected acceleration frequency spectra to the at least one frequency profile, sending a theft detection signal only when at least one acceleration signal frequency below the threshold frequency is detected and based on the comparing, the detected acceleration frequency spectra are determined to be characteristic of the theft condition, and

initiating the production of an alarm based upon the detected theft condition.

2. The system as recited in claim **1**, wherein the alarm is an audible sound.

3. The system as recited in claim **1**, wherein the isolating the frequencies characteristic of movement of the device comprises:

low-pass filtering the acceleration signal in order to attenuate frequencies of the acceleration signal not characteristic of movement of the system.

4. The portable electronic device as recited in claim **1**, wherein a false alarm is prevented by

further filtering out acceleration signals that do not represent a theft condition.

5. The portable electronic device as recited in claim **4**, wherein the acceleration signals that do not represent the theft condition include acceleration signals corresponding to a shock or an impact.

6. A method for providing theft protection for a portable device by a theft protection system, comprising:

displaying a graphical user interface configured to display a theft detection system menu and arranged to provide assistance to a user, wherein the assistance includes initiating the theft detection system and configuring the theft detection system to initiate an output of an alarm using an output device when a theft condition is present wherein when the theft detection system is not active, the graphical user interface receives a user input event at the theft detection system menu for activating the theft detection system, otherwise, the graphical user interface receives a user input event at the theft detection menu for configuring the theft detection system;

acquiring an acceleration signal corresponding to an acceleration of the theft protection system, the acceleration signal having frequencies characteristic of movement of the portable device;

processing the acceleration signal by

isolating the frequencies characteristic of movement of the device,

detecting acceleration signal frequencies below a threshold frequency indicative of the theft condition,

detecting acceleration frequency spectra of the detected acceleration signal frequencies that are characteristic of a theft condition,

scanning for at least one frequency profile consistent with at least one theft condition,

comparing the detected acceleration frequency spectra to the at least one frequency profile,

sending a theft detection signal only when at least one acceleration signal frequency below the threshold frequency is detected and based on the comparing, the detected acceleration frequency spectra are determined to be characteristic of the theft condition; and

initiating the production of an alarm based upon the detected theft condition.

7. The method as recited in claim **6**, wherein the alarm is a audible sound and wherein the frequencies are isolated by low-pass filtering the acceleration signal in order to attenuate frequencies of the acceleration signal not characteristic of movement of the system.

8. The method as recited in claim **6**, wherein the acceleration based theft detection system is incorporated into a portable electronic device.

9. The method as recited in claim **8**, wherein when the portable electronic device undergoes manual transport, the portable electronic device experiences an acceleration in accordance with manual transport in a range of 1-25 Hz due to the rhythmic movement caused walking or running of an individual in possession of the portable electronic device.

10. The method as recited in claim **9**, wherein an individual in possession of the portable electronic device is determined to likely be a thief only when it is determined that the portable electronic device is undergoing accelerations in accordance with the manual transport acceleration and accelerations having an acceleration frequency spectra in the range of 100-200 Hz consistent with the individual in possession of the portable electronic device jumping or quickly changing direction.

11. The method as recited in claim **6**, wherein the user can change a sensitivity setting of the acceleration based theft detection system using the graphical user interface.

12. The method as recited in claim **11**, wherein the sensitivity setting is related to a minimum duration during which an acceleration profile matching that of a theft is detected, wherein a higher level of sensitivity corresponds to a shorter duration before which the theft alarm is signaled.

13. The method as recited in claim **11**, wherein the sensitivity setting is set to a minimum number of discrete frequency values that are detected and that must match a given frequency profile before the theft condition is signaled.

14. The method as recited in claim **6**, wherein a false alarm is prevented by

further filtering out acceleration signals that do not represent a theft condition.

15. The method as recited in claim **14**, wherein the acceleration signals that do not represent the theft condition include acceleration signals corresponding to a shock or an impact.

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